Crystal Growth in Japan

Langasite single crystal

The Institute for Materials Research, Tohuku University, and the Tokyo Denpa Co. Ltd., claim to have made Japan's first langasite single crystal. The 2-in single crystal was produced by a lift process with the potential for larger, 3- to 4-in crystal and hence, mass-production of this interesting piezoelectric material.

The expectation has been that this material – $La_3Ga_5SiO_{14}$ – would have properties superior to lithium niobate and quartz but was difficult to produce with sufficiently good crystallinity and purity. It is expected to find application in high frequency communications devices such as resonators and filters.

La2NiO4 + sigma single crystals

Wen-Jye Jang, et al. of the Institute for Solid State Physics, the University of Tokyo, reported "large, homogenous single crystals of La_2NiO_4 + sigma 7 mm in diameter and 20 mm in length" by the float zone method, in *J. Crystal Growth* (152 (1995) 159-168).

High temperature superconductivity in this compound has been under investigation for some time and is understood to be related to deviation in oxygen content. This study was set up to investigate this effect on crystal structure and electrical and magnetic properties. However, growing the single crystal is difficult under such circumstances, the group overcame this and was able to limit the effect by use of a lamp-image floating-zone type furnace. This has the ability to expose the growing crystals to various pressures of oxygen between 1 and 5 atm. The results indicated that the method was very effective for incorporation of much more excess oxygen compared with the annealing method after growth.

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Ferroelectric films from polymer

Epoxy Technology Inc., (Billerica, MA, USA), has a method for making ferroelectric thin film coatings – PZT and PLZT – which is "inexpensive... can be applied by dipping, spinning or spray coating". The "special advanced metal polymer solution" used, is, ETI claims, more efficient and cost-effective than sputtering, CVD, plasma or the sol gel process.

After application, the solvent evaporates and the coating fired at 400°C to form an amorphous metal oxide which is "pinhole free with excellent adhesion and planarity". By further firing to 550°C the required Perovskite structure is formed and 0.05-2 μm stoichiometric films can be produced by the process.

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PL of RE-doped GaAs

The various degrees of incorporation of Pr into GaAs during LPE from a Ga-rich solution have been investigated by Gwo-Cherng Jiang et al, from Taiwan. The results are published in *Journal of Crystal Growth* 152 (1995) 127-134 and show how the peaks in the epilayer PL spectra vary according to Pr-doping. For instance, the PL of the low-doped epilayer demonstrates an obvious gettering effect on the donor-related peaks. For high-doped, a defect-related (dX) emission peak was produced.

The epilayers were also studied by XRD, SIMS and Hall measurements etc. to determine the correlation of PL properties with the amount of Pr-doping. XRD showed slight increases in a lattice mismatch with doping and all epilayers were p-type - the Pr seems to preferentially getter n-type impurities.

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JME-DuPont cross-license materials

"World-leader in die-attach materials forges deal with world-leader in thick-film materials."

Johnson Matthey Electronics and DuPont Electronic Materials are cross-licensing electronic materials technologies used in semiconductor packaging and hybrid circuit manufacturing. This is the second licensing agreement between the two companies and they look forward to exploring additional opportunities for cooperation.

The deal gives JME the world rights to manufacture, use and sell a specific silver-filled glass composition used in bonding devices into hermetic packages.

DuPont, in return, is licensed to produce, use and sell certain of JME's gold powders, gold pastes and dielectric pastes used in manufacturing thick-film hybrid circuits. These will be manufactured at the N. Carolina and Puerto Rico facilities. Meanwhile, JME will produce the silver products at its San Diego factory, the "focal point for its development and production of die-attach adhesives and related materials for semiconductor packaging".

In the early 1980s, JME pioneered the development of silver/glass die-attach paste for hermetic packaging, known as AuSub, and continues to be a leading market supplier.

More recently, the San Diego business unit has led the commercialization of silver-filled cyanate ester die-attach adhesives for both hermetic and plastic packaging.

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